ISSUE 1 / 2013

DATA – FACTS – ANALYSIS

CUTEC-News

SOAM – SAFE WIND PARKS

GREAT NEWS! CUTEC WINS 2012 GERMAN MINERAL RESOURCE EFFICIENCY AWARD

Group photo showing the award winners and consortium partners at the presentation ceremony in Berlin.

Everyone involved was exceptionally pleased when the letter from the German Mineral Resource Agency came through the door in the middle of October officially confirming that the CUTEC Sustainability Management Cluster's (CNM) entry for the 2012 German Mineral Resource Award had earned us a place in the winner's circle. The big day arrived on November 29th. At the conference on efficient use of mineral resources & success in the marketplace hosted by the German Ministry of Economics in Berlin, State Secretary Dr. Bernhard Heitzer presented the 10,000 euro award to CUTEC Managing Director Prof. Otto Carlowitz and the two project leaders Dr. Torsten Zeller and Andreas Sauter. The project partners which included the Institute of Mineral and Waste Processing, Waste Disposal and Geomechanics at Clausthal University of Technology (IFAD), Andritz Sundwig GmbH, Fritz Winter Eisengießerei GmbH & Co. KG, Rohstoff-Handelsgesellschaft mbH, Xstrata Zink GmbH and Wolfsburg AG were also represented on stage at the presentation ceremony. The award gives due recognition to the Zinc Recovery from Steel Scrap consortium project for its "outstanding and innovative contribution to the efficient use of mineral resources". CUTEC acts as project coordinator. The project is embedded into the 2020 high-tech strategy put in place by the Ministry of Education and Research (BMBF). The three-year project was part of the "r²" research programme on innovative technologies to boost resource efficiency in mineral resource intensive production. Funding was channelled through the Berlin office of Project Management Jülich (PTJ). The Zinc Recovery from Steel Scrap project focused on a new approach to zinc recycling in the automotive industry. Large volumes of galvanised sheet metal scrap (primary scrap) accumulate in automotive production. The current recycling process is to melt the scrap trimmings in electric furnaces. The zinc vaporises but only a portion of it can be recovered from the filter residue. The entire process is also very energy and resource intensive, and it has a considerable negative environmental impact. Compared to the conventional technique, the new bypass zinc recovery process improves energy efficiency by roughly 75%, reduces CO_2 emissions by around 80% and significantly increases the proportion of zinc which is recovered in the new waste-free recycling process. Due to the high purity and the presence of hardening by-elements, the de-zinced steel sheet can be used as very high-grade stock in the foundry industry. Sulphuric acid solution is used to remove the zinc from scrap on the semi-industrial scale pilot line which was installed at CUTEC in 2010. The line consists of 5 pickling and washing baths. It was originally designed with a nominal throughput capacity of 10 tonnes per day. Optimisation carried out by IFAD has now increased that figure to 100 tonnes. Building on the experience gained during operation of the CUTEC line, a car manufacturer in Lower Saxony is planning to install an industrial zinc recovery line in 2013. Two international patents have been granted for the new process used to treat primary scrap. Due to the presence of paint coatings and other substances adhering to the sheet metal such as oil and grease, the process is not unsuitable, or can be used only to a very limited extent, to treat

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CNM* ACQUIRES BMBF HOVEMAS PROJECT

The Cluster Sustainability Management (CNM) has acquired a project entitled “Innovative Techniques for High-Quality Recycling of Magnesium Chips” (HOVEMAS) from the Federal Ministry of Education and Research (BMBF). Project Management Jülich (PTJ) in Berlin is acting in the administrative liaison role, and CUTEC will be the consortium coordinator. The Institute of Metallurgy(IMET) at the Clausthal University of Technology along with SKW Stahl-Metallurgie Holding AG, Magrec Recycling GmbH and Fritz Winter Eisengießerei GmbH & Co. KG are the members of the project consortium.

Magnesium is a strategic metal. The annual worldwide production is approximately one million tonnes and continues to increase at a considerable rate. The supply of magnesium products to the European machinery manufacturing, automotive and steel industry is more than 90% dependent on China. Production is very energy-intensive, particularly because of the strong chemical affinity with oxygen and chlorine. Recycling has now become a very significant factor. Scrap metal has the advantage that the energy needed for reduction has already been expended. Energy consumption during primary production is at least 30-35 kWh/kg of magnesium, causing substantial CO_2 emissions. In comparison, far less energy (approx. 1 kWh/kg of magnesium) is needed to re-melt clean scrap.

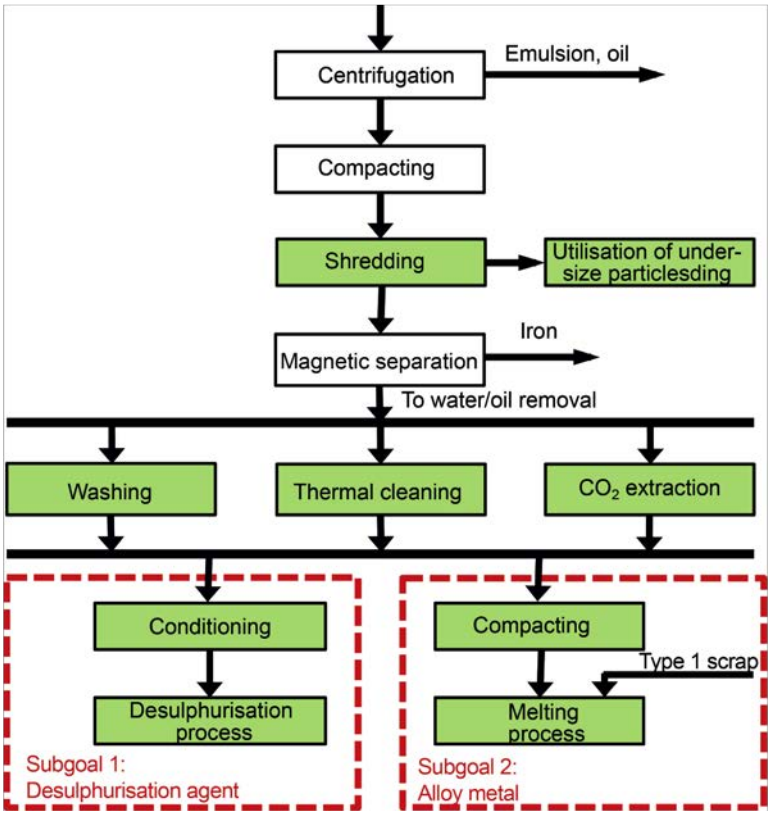
Magnesium alloy chips in the die casting industry cannot currently be recycled. In secondary recycling, there is currently no economically feasible way to utilise the metal content of magnesium alloy chips which cannot be returned directly to the foundry recycling loop.

The overall goal of the project is to develop techniques to recover magnesium from magnesium alloy chips.

Two basic usage pathways are envisaged:

1. Use as magnesium granules for pig iron desulphurisation to meet the requirements of the iron and steel industry.
2. Return magnesium as a secondary material to the metal alloy recycling loop.

The project will provide the first feasible route for recovering secondary raw materials which up to this point have not been returned to the recycling loop. (dm)



Process concept for HOVEMAS and need for research (green)

Metal expertise – safeguarding the future

Stephan Weil, SPD candidate for the office of Minister President, along with an SPD delegation paid a visit to the Clausthal research cluster on October 29th at the invitation of REWIMET**. CUTEC’s contribution to energy and resource efficiency was given ample space on the visit itinerary. Weil was visibly impressed as Prof. Carlowitz outlined our research activities which focus on practical application. Real-world implementation of the research results, particularly by the Sustainability Management Cluster, ensures that the solutions meet tomorrow's needs. Close linkages with the regional metallurgy and metalworking industry along with the recycling cluster at TU Clausthal in partnership with REWIMET give the region a significant advantage as a business location. Weil emphasised the fact that the Harz region has more to offer than attractive natural surroundings and tourism. He described it as an established centre of expertise in metals and metal recycling. Something like 30 strategic industrial metals are currently being recovered here. Using this profile as a base, the task at hand is to take specific action to enhance regional development. Let’s do it! (ze)

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GREAT NEWS! …

secondary scrap, for example from car recycling. Instead, the conventional rolling process is still the standard technique. The proportion of primary scrap in total recycled scrap volumes is currently in the single digit percentage range. The German Mineral Resource Efficiency Award sponsored by the German Ministry of Economics and Technology in partnership with the German Mineral Resource Agency gives recognition to outstanding examples of mineral resource and material efficient products, processes, services and/or applications-orientated research in the business sector. Presentation of the Award is intended to reinforce the importance of mineral resource and material efficiency in industry and raise awareness for this vital issue. The Award was presented to 5 winners for the first time in 2011. (ze/sr)

**REWIMET: Lower Saxony strategic industrial metal recycling cluster

SOAM PROJECT: DETECTION, IDENTIFICATION AND CLASSIFICATION OF CONTAMINATED MILITARY DUMP SITES

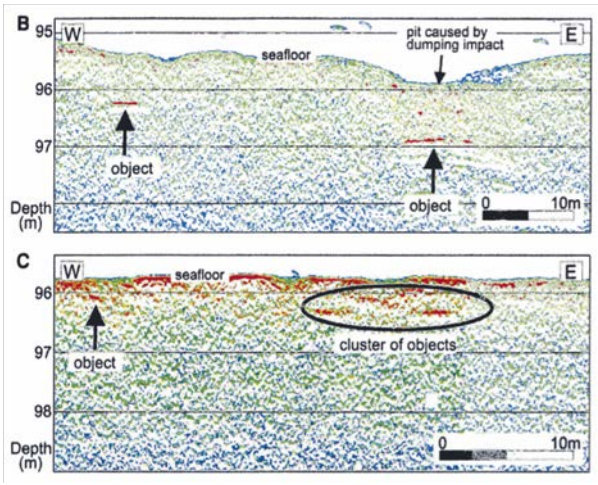
Following the passage by roll call vote of the 13th revision to the Atomic Power Act in the German Bundestag on June 30th 2011, the North Sea and Baltic Sea have now definitely become part of the industrial landscape. 42 offshore wind parks with a peak output of 44 520 MW will soon be generating renewable energy.

The enormous challenge of building wind parks on such a massive scale extends beyond the technological and engineering aspects.

Conservative estimates indicate that 1 800 000 t of conventional munitions and 230 000 t of chemical munitions have been dumped over large areas in German waters alone, and the exact location of the dump sites remains unknown. In addition to mine fields which are still in existence, some areas have been identified as contaminated, but the assumption has to be made that hazardous war-related material may be present in all other areas as well.

The illustration below showing some of the dump sites gives you an idea of the vast size of the area where disposal of unwanted munitions poses an environmental threat.

So far, locating and recovering the hazardous material has generally involved a painstaking effort. In many cases, it has been necessary to send divers down, in best case scenarios following scanning with towed sensors.



Example of seismic tomography imagery of munitions which needs to be analysed

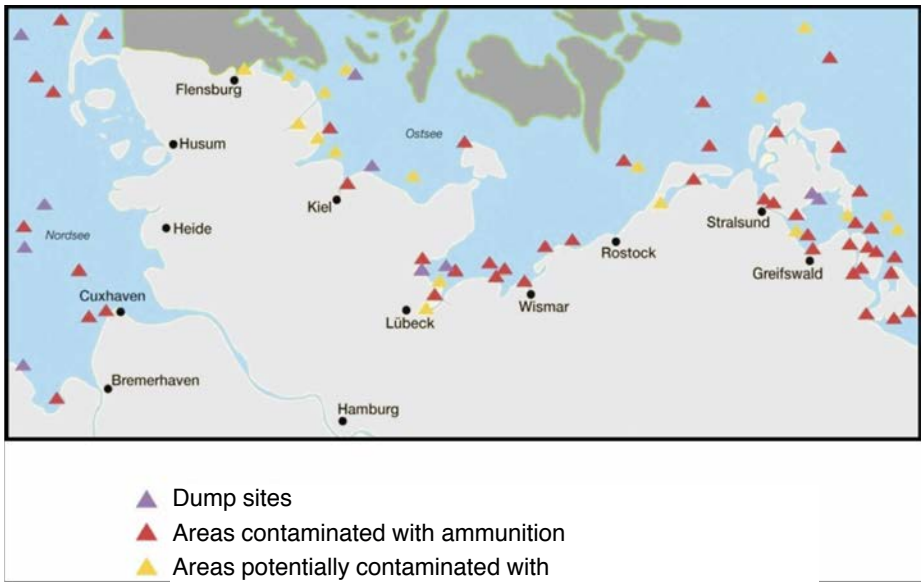
The state of the material retrieved covers the entire spectrum from "munitions heavily degraded by corrosion" to "munitions preserved by shell limestone etc. which are virtually intact".

These latter munitions in particular are fully functional. As a result, before wind generators can be anchored to the North Sea and Baltic Sea beds and connected to land, the affected areas must be decontaminated.

This being the case, a consortium made up of WTD* 71, Atlas Elektronik, Hirdes EOD and CUTEC was formed in October 2011 to provide a means of automatically detecting, identifying and classifying hazardous submerged waste using the latest underwater location technology and autonomous underwater vehicles. CI**-based methodologies will have to be developed, tested and deployed in prototypes. GPGPU*** development techniques using CUDA**** will be used to develop the high-speed algorithms that will be needed to handle the enormous volume of data.

Prof. Matthias Reuter, who is head of the Modelling and Simulation Department at CUTEC, will act as Coordinator on this project which is funded by BMWi (Ministry of Economics and Technology). The project got underway on October 1st, 2012. (re)

*WTD = Defence Technology Centre
**CI = Computational Intelligence
***GPGPU = General Purpose Computing on Graphics Processing Units (GPUs are used in combination with the CPU to increase the speed of scientific and technical applications)
****CUDA = Compute Unified Device Architecture which increases computational speed by making GPUs accessible for computation.



Major munitions dump sites in the North Sea and Baltic Sea region

IMPRINT

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5TH LOWER SAXONY FUEL CELL SUMMER SCHOOL – A REVIEW

Students and lecturers in front of the NEXT ENERGY building in Oldenburg

An article published in the Oldenburg Nordwest-Zeitung entitled "Energy Transition – Young Researchers Take Up the Challenge" contained a report on the Fuel Cell Summer School. During a visit to the EWE NEXT ENERGY research centre, journalists from the Delmenhorster Kreisblatt were able to get a firsthand impression of the information sharing platform which offered a broad range of basic knowledge and information with significant practical relevance. They were impressed with the level of enthusiasm shown by the students and doctoral candidates who attended this event series which is unique nationwide and addresses the "great future challenge of energy supply", as one of the attendees put it in a discussion with the journalists.

CUTEC was selected by the Lower Saxony Ministry of Economics, Labour and Transport to organise the Summer School again this year. The students also had the opportunity to learn more about NEXT ENERGY, the Lower Saxony research institution which hosted the event.

Support was provided by EWE AG, IAV GmbH, H.C. Starck GmbH and Volkswagen AG which are industrial partners in the State Fuel Cell and Electromobility Initiative as well as by the universities in Braunschweig and Clausthal and the Wolfsburg campus of Ostfalia University.

50 students and doctoral candidates were on hand at the 5th Lower Saxony Fuel Cell Summer School in Oldenburg on September 24th – 28th. The event was fully booked weeks in advance. Those who missed out have been put on a waiting list for next year. The message is obviously spreading that the Summer School offers real quality and a great atmosphere. The consensus following a week of lectures, practicals, discussions and the generation of presentations was overwhelming and unanimous: "great credit is due to the organisers and sponsors, great lectures covering a wide range of topics, very good mix of information from the research and industrial communities."

Following words of welcome by the event host Prof. Agert, the representative of the Lower Saxony Energy Storage and Systems Initiative, Mr. Bub from innos-Sperlich and Mr. Dietrich from CUTEC which organised the Summer School, scientists based in the local region provided an insight into the fundamental scientific principles involved in fuel cells and battery technology such as electrochemistry, thermodynamics, materials, parts, components and systems.

The list included Prof. Agert and Dr. Dyck from NEXT ENERGY, Prof. Wittstock from the University of Oldenburg (C-v-O), Prof. Krewer and Mr. Haselrieder from TU Braunschweig, Dr. Dörrer, Prof. Wenzl, Prof. Kunz and Prof. Turek from TU Clausthal and Dr. Lindermeir from CUTEC. Prof. Lehnhoff from the University of Oldenburg and Dr. Hermsmeier from EWE AG gave presentations outlining the conclusions which must inevitably be drawn from Germany's energy transition policies.

Dr. Arndt, EWE AG, Mr. Zobel, NEXT ENERGY, Dr. Otterstedt, H.C. Starck GmbH, Mr. Meinel, I+ME Actia GmbH, Dr. Antonius, Johnson Controls, Dr. Arendt, Dr. Kleppa and Dr. Hofmann from Volkswagen AG and Dr. Hickmann, W. Eisenhuth GmbH, shared information on applications and existing problem areas. Experts based in Bavaria (Dr. Hofmann, Siemens AG), North Rhine-Westphalia (Mr. Lohren, Ceramic Fuel Cells), Mecklenburg-Vorpommern (Dr. Boltze, new enerday) and Saxony (Mr. Strohbach, Staxera GmbH) also gave talks.

Summer School students worked in teams to solve complex tasks

Practical exercises gave the scientists from Lower Saxony a good opportunity to familiarise the Summer School students with the subject matter. CUTEC organised a hands-on fuel cell workshop. NEXT ENERGY provided helpful support at the hands-on battery workshop which had been originally designed and organised for last year's Summer School by the Institute for Chemical Process Engineering. There was also an excursion to the EWE FutureCentre at the Emstek Ecopark, which provided the opportunity to witness a demonstration of how fuel cells might be used in detached houses of the future and also to explore the capabilities of Electromobility.

After a week filled with the basic scientific fundamentals, current research results and highly interesting hands-on experience, the course participants were in a better position to decide whether they might want to specialise in fuel cell and battery technology in the future. Lower Saxony is leading the way by giving young members of the academic community a greater insight into technology which will play a major role in the energy transition and by providing a platform for sharing information with the world of science and industry. (di)